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Apple trees were introduced to the Atlantic region by the Acadian settlers and can be grown in all parts of Nova Scotia and in many locations in New Brunswick, Prince Edward Island and Newfoundland. Apple trees are the hardiest of the tree fruit species and can withstand lows in excess of -30°C during full dormancy. The length and warmth of the growing season is often more restrictive to apple production than winter temperatures. Certain varieties are more adapted to one area than to another and this will be noted in the variety descriptions.

SITE SELECTION: The most important factor in the successful production of apples is the selection of the planting site. The main factors to consider in this area are:

1. **DRAINAGE** - Apple roots will not tolerate excessive water (poor drainage). The water must run off or run through the soil relatively quickly.

2. **FERTILITY** - The soil pH should be within the range of 5.5 to 6.5. Phosphate and potash levels in the soil should be within the 400 to 500 kg/ha (200 to 259 ppm) range.

3. **SOIL TYPE** - All soil types are suitable for apples - gravel, sandy loam and clay loam but they must be well drained. Sandy loam and clay loam soils are the best. The best soil conditions are those that allow the roots to grow to a depth of one meter or more. A soil test performed by a reputable laboratory can determine soil type and fertility levels.

4. **WINTER CONDITIONS** - Attention should be paid to the snow and wind conditions at the proposed planting site during the winter months. Ideally the site should not be overly windy, have a slight grade and consistently have a 20 to 60 cm of snow cover through January and February. Areas where deep drifting occurs should be avoided as heavy snow load can cause major damage to the lateral branches.

5. **FROST** - Avoid planting in low lying areas which are more prone to late spring and early fall frosts. Spring frost can kill flower buds while fall frost can damage the fruit. Planting apple trees on sloping land or next to large bodies of water can help reduce the risk of frost damage.

6. **EXPOSURE** - Avoid planting in shady and windy areas. Excessive shading can have a detrimental effect on fruit production, fruit quality and disease control. Tree growth, fruit production, and fruit quality are adversely affected by high winds.

PREPARATION FOR PLANTING: Start planning at least one year in advance of planting. Work the soil during the summer or at least the fall before planting. Soil with low phosphate or potash levels should have manure or fertilizer containing these two nutrients applied at this time. Apply limestone at a rate of up to 1 kg/m^2 and work into the top 7 or 10 cm of soil. Most soils in the Atlantic Region are acidic and need to be limed to raise the pH.

Select the varieties you want the fall before planting and place your order to be assured of receiving the desired varieties. Garden Centers are one source of fruit trees however, variety selection tends to be more limited than that of a fruit tree nursery.

PLANTING: Apple trees should be planted in the spring before the buds begin to grow. In the Annapolis Valley, this is prior to May 15. Dig a hole large enough to hold all roots in a spread out position. The top most roots on the tree trunk should be at least 15 cm below the soil surface. Pack soil firmly around all roots to avoid air pockets. Tramp soil in around the tree until the tree is firmly in place, then water. Be sure to leave the union (where the variety is grafted unto the rootstock) 5-10 cm above the soil line. Failure to do so will result in the loss of rootstock effect on tree size and fruit production. To prevent bending and breaking, the home gardener should consider staking the tree at the time of planting. In the case where a dwarf rootstock is used the stake should be of a permanent nature such as a 2.5 to 3 m pressure treated post.

When planting leave adequate space between trees and away from buildings to accommodate the mature tree size. Note that the mature tree size will depend upon rootstock, variety and soil type. Consult a garden center employee or the home garden specialist as to the potential tree size for the variety rootstock combination which is to be planted.

POLLINATION: Apple blossoms will not produce fruit unless they have been pollinated by a suitable pollinator variety. McIntosh for example, must be pollinated by another variety such as Cortland and not another McIntosh tree, in order to produce fruit. The bloom period of different varieties must overlap for cross pollination to occur. Early blooming varieties such as Idared are not good pollinators for late blooming varieties like Spy. Some varieties such as Gravenstein and Jonagold produce non-viable pollen and are not good pollinators and thus three different apple varieties are required when planting these selections. Flowering crabapples can be a source of pollen provided their bloom period overlaps the apple variety. Insects and bees transfer pollen from one variety to another and therefore insecticides **must not** be used during the bloom period.

PRUNING: Except at time of planting, it is recommended that apple trees be pruned in the spring while they are dormant. There are many forms to which apple trees can be trained. The pruning and training method described below is for a central leader tree which is a tree form that should provide good fruit productivity and quality while not being overly complicated for the home gardener.

When planting: A one year old tree without limbs should be cut back to 1 meter above the ground. Trees with fewer than four healthy limbs should be restarted by removing the limbs and cutting the tree back to 1 meter. Where there are four or more limbs on the tree, remove limbs that are broken, limbs that are too close to the ground (below 0.5 m) or those forming a narrow crotch angle with the main trunk. Head the tree back to 45 cm above the first limb.

Second Season: select up to four branches of about equal size having wide crotch angles (45°) and uniformly distributed around the trunk. It may take 2 years to select the four desired limbs which will form the main framework of the tree along with the central leader. Limbs that compete with the four limbs or those with a narrow crotch angle should be removed.

Third and later seasons: A second and third set of permanent scaffold limbs can be developed depending upon the final tree height of the tree. Sets of scaffold limbs should be spaced at least 1 m apart on the trunk. Progressing up the trunk the limb diameter should diminish. Limbs above a permanent limb should not be greater in diameter than the permanent limb below it. If possible avoid allowing the diameter of a permanent limb to become more than 50 percent the diameter of the trunk immediately above it. At maturity the tree should have a Christmas tree or pyramidal shape. **Maintenance Pruning:** Apple trees should be pruned on an annual basis to keep fruit spurs and fruiting wood in a healthy and vigorous state with good exposure to sunlight. A well pruned tree will be less prone to fungal diseases. Pruning should primarily consist of thinning cuts (whole limb removal) and removal of upright or drooping limbs. Some heading cuts (shortening of limbs) may be required on limbs that have become too long or tall. Aim to remove up to

10% of the bearing area on an annual basis. Removing too much wood will result in excessive sucker growth and reduce fruit quality.

FERTILIZER: Apply 500 g of 6-12-12 per year of tree age up to a maximum of 7 kg per mature tree. The fertilizer should be applied in the spring prior to June. When applying fertilizer, distribute the fertilizer evenly under the branch spread. Manures, compost and mulch can be used to replace mineral fertilizers. Because the composition of manures varies with source, age and storage, it is difficult to judge how much to use, and with richer manures, it is easy to over fertilize. The fertilizer needs of mature trees range from 27 kg/10 m^2 of cow manure stored outside to 4.5 kg/10 m^2 of fresh poultry droppings. Manures should not be spread around fruit trees from May 1 to November 1. Decomposable organic mulches can reduce fertilizer needs, and if rich enough, e.g., waste hay, can entirely replace mineral fertilizer. A mature tree will require 1 to 2 bales of hay for the first mulching, after which ½ to ¼ bale every other year should be sufficient. Growers using mulch should be cautioned that the mulch can provide an ideal habitat for rodents which can feed on the tree bark in times of food scarcity.

WEED CONTROL: Hoe or cultivate lightly to remove competition for the first three years. Seed down with good lawn seed and keep well mowed. A grass or straw mulch spread under the tree will also help to control weeds while retaining soil moisture and adding fertility to the soil.

ROOTSTOCKS: Apple trees are not grown from seed. The variety is grafted onto a root system which in turn controls the growth and productivity of the variety. There are a considerable number of rootstocks used for apple trees which are placed into two categories: seedling rootstocks and clonal rootstocks. Seedling rootstocks are grown from seed and generally are hardy and vigorous. Apple trees grown on seedling rootstock generally are large trees, however, the seedling Beautiful Arcade produces trees that are semi-vigorous (5-6 meters in height). The availability of apple varieties on seedling rootstock is limited; they are recommended for areas where hardiness is a concern or soil depth is restricted.

Clonal rootstocks are produced by vegetative propagation. Apple trees grown on clonal rootstock can vary in size from a full tree 10 m in height to a dwarf tree that is less than 1 m in height. The rootstock MM111 is suggested for medium to medium large trees, M7 and MM106 for medium size trees and M26, M9, Ottawa 3 and Bud 9 for dwarf or small trees. Apple trees grown on M7 and dwarf rootstocks will require a support system such as a single stake or trellis-system. Failure to support these trees will result in leaning of the tree and possible breakage at the graft union. Dwarf rootstocks should only be used on rich fertile soils with a rooting depth in excess of 1 m.

VARIETIES: Named apple varieties number in the thousands. Those listed are varieties of proven performance in the Atlantic Region. Harvest dates are based upon those of the Annapolis Valley and would be the earliest for most of the Atlantic Region.

EARLY-SEASON

Vista Bella - This variety ripens in early August. The tree is very vigorous with upright growth when young, and a terminal bearer tending to annual cropping. Fruit is medium in size, attractive (red blush over a yellow green background), with a crisp, cream-white flesh, and firm for an apple of this season. Ripens somewhat unevenly however, two pickings should be sufficient. Stores well for an early apple.

Jerseymac - This is a McIntosh type that ripens a month earlier than McIntosh, mid to late August. The fruit is of good size, uniform in shape, attractive (solid red blush over green background) in appearance and fair to good in quality. The trees are moderately hardy, vigorous and productive however, very susceptible to apple scab. The fruit has a short storage life.

Gravenstein - The first high quality apple of the season, maturing the second week of September. It is a dual purpose apple being suitable for pies, sauce, frozen, slice and eating fresh. The crisp, juicy, spritely flavor makes it well known in the Maritimes. It is a winter tender variety and should only be grown in the warmer areas of the Atlantic Region where winter extremes do not

surpass -30 °C. Red strains, such as Washington, have replaced the old fashioned Gravenstein which is a striped apple originating in Germany pre 1800.

The apple is medium to large in size, with a red blush over a greenish yellow background. The tree is vigorous, upright spreading, tending to be biannual in bearing (producing fruit every other year). It is a triploid variety and thus cannot be used as pollen source for cross pollination. Can be stored in cold storage for about six weeks.

Paulared - This variety matures about the same time as Gravenstein but is hardier. A medium sized apple, developing a solid dark-red blush over a light yellow ground colour. The flesh is very firm and is of fair to good eating quality. The tree is vigorous, upright and productive with the fruit produced in clusters on the terminal ends of the shoots. A fresh fruit variety with moderate storage life.

Lobo- A variety similar to McIntosh in appearance but hardier, maturing 10-14 days prior to McIntosh and worthy of planting where hardiness is of concern. Trees are moderately vigorous and more biannual (tendency to only produce apples every two years) in production than McIntosh.

MID-SEASON

McIntosh - The most commonly grown commercial variety grown in the Atlantic Region. The fruit is medium size, very attractive, blushed to solid red over green background, with a crisp, juicy, sub-acid flesh. The tree is hardy, moderately vigorous, hardy and productive but susceptible to apple scab. There are many strains of this variety in degree of redness and fruit spurs. The spur types are less vigorous and are recommended where space is limited.

McIntosh is classed as a fresh fruit variety and does not have any special cooking qualities. The fruit bruises easily and drops quickly from the tree when mature. Storage life is 2-3 months in cold storage.

Cortland - This large apple matures about a week after McIntosh and is harvested the first week of October. Fruit medium to large, washed and striped with red, white fleshed and non-browning. The tree is medium in vigor, spreading, productive being a terminal bearer (fruit is produced on the ends of shoots or limbs) and hardy. A good dual purpose apple, excellent for salads, pies, sauce and fresh consumption. One of the best all around apples for this region. Storage life is 2-3 months in cold storage.

LATE SEASON

Spartan - Fruit is medium in size and practically 100 percent red in colour and matures early-mid October. The fruit tends to be small on older trees. The flesh is cream, crisp, sub-acid and slightly aromatic. The tree is a vigorous upright, annual producer and hardy. A good fresh fruit variety with fair to good cooking traits which tends to perform best under warm growing conditions. Storage life is 3-4 months in cold storage.

Red Delicious - Is ranked as first in terms of North American apple production. It grows best in warmer climates than that of the Atlantic Region where it does not mature well and the tree is winter tender. The fruit is of good quality when grown large and requires extra care to accomplish. The fruit is harvested about October 10. It is a fresh fruit variety which will store up to 4 months in cold storage.

Idared - This is a very productive and early bearing variety that has dual purpose qualities. Fruit is medium large, red to red blushed over yellow background; flesh cream, firm and sub-acid after storage. Tree moderately hardy, small, upright, spurry, and tends to be biannual. It is an early flowering variety and is a good pollinator for Gravenstein. Fruit is mature mid-late October and can be stored for up to 6 months in cold storage. A good cooking and fresh fruit variety that needs to be stored before it is edible.

Northern Spy- An old variety which dates back to 1840 and is considered to be the premier pie apple. The fruit is large, blushed, flesh cream, tender, mild aromatic and sub-acid. The tree is very vigorous, upright, slow to bear fruit and biannual. Ideal for pies, frozen slices, sauce and for fresh apple consumption. Storage life is up to

6 months in cold storage.

Others-Those gardeners who have a preference for aromatic, high quality apples can plant one or more of the following varieties: Cox's Orange Pippin, Gala, Golden Nugget, Golden Russet or Jonagold. The shortcoming in productivity and fruit size for the majority of these varieties is offset by the fruit quality. There are numerous other apple varieties either new or old that are quite suitable for the Atlantic Region which have not been mentioned because they are not readily available to the home gardener.

DISEASE RESISTANT VARIETIES: These varieties provide the home gardener the opportunity to successfully grow apples without having to apply fungicide sprays. New disease resistant varieties are being introduced on an annual basis and fruit is quality improving with these introductions. While being resistant to the fungal disease apple scab, these varieties may or may not be resistant to the following diseases: powdery mildew, fire blight, cedar apple rust, and quince rust. Apple scab is the most common of these diseases and attacks the foliage and fruit and appears as black circular spots. Disease resistant varieties however, are not resistant to insect pests and these will have to be controlled with an insecticide or alternate treatment when the need arises. Fruit size and quality continue to improve with new introductions and now equals or surpasses some of the more commonly grown varieties. You may experience difficulty in obtaining all the listed varieties in this publication as some are new varieties and the demand for scab resistant varieties is limited.

Redfree - Harvest in early September. The tree is upright, spreading and productive. Fruit is medium size with 90 percent red colour and a smooth, waxy, russet-free skin. Skin becomes greasy when over mature. Flesh is cream, crisp and juicy. Fruit requires thinning for good size and best quality. One of the better selections to be evaluated to date at Kentville. Storage life is 2 months in cold storage, 0 to1 °C.

Prima - Harvest in mid-September. Tree is vigorous, upright, spreading and bears fruit annually. Fruit is medium size, striped and washed with crimson over yellow ground colour. Flesh is white, with green tinge, fine texture and fair flavor. The fruit may break down if allowed to become over mature before harvest. Storage life is 1 month in cold storage, 0 to1 °C.

Novamac - Harvest in mid September. Tree moderately vigorous, upright spreading and bears annually. Fruit size is medium, slight smaller than McIntosh, 50-90 percent red blush or striped over a pale greenish yellow background. Flesh creamy white, fine, tender, moderately crisp and juicy. A good selection for those who like McIntosh. Storage life is 3 to 4 months in cold storage, 0 to1 °C.

Freedom - Harvest in early October. Tree is vigorous, spreading and very productive. Fruit medium-large sized with bright blush-stripe on a yellow background, 60 percent red. Flesh is creamy white, juicy, medium-coarse and subacid. Good for fresh fruit consumption as well as sauce and juice.

Liberty - Harvest early-mid October. Tree is vigorous, spreading and very productive. Fruit medium sized with a dark red blush over a yellow ground colour. Flesh is light cream in colour, crisp and juicy. A good dual purpose selection which has a cold storage life of 4-5 months.

Nova Easygro - Harvest in mid-October. Tree is moderately vigorous, spreading and bears fruit annually. Fruit is medium size, striped or dull red blush over a greenish yellow background. Flesh is creamy white, moderately fine, firm and crisp. Storage life is 2-3 months in cold storage, 0 to1 °C.

Novaspy - Harvest mid-late October. Tree is upright-spreading, moderately vigorous, moderately productive and annual cropping. Fruit medium size, sightly ribbed, 30-85 percent striped to blush over yellow ground colour. Flesh creamy yellow, fine crisp, juicy and subacid. A good dual purpose apple with quality traits similar to Northern Spy. Stores 4-5 months in cold storage, 0 to1 °C.

There are a number of new scab resistant selections undergoing evaluation at the Kentville Research Station. Some of these selections that may be suitable for the Atlantic Region are

Pristine, William's Pride, and Dayton.

HARVESTING: Apples should be picked at the proper stage of maturity. Immature fruit will lack characteristic flavour and texture, while over mature fruit will be soft, mealy in texture and more prone to fungal disease and breakdown when placed in storage. The home gardener doesn't have the means to determine fruit maturity on a day to day basis. The approximate harvest dates given above are based upon maturity development in the Annapolis Valley.

STORING FRUIT: Bruise-free apples keep best when stored at 0 to 1°C. Avoid freezing the apples. Cold storage periods for apples vary from 0 to 6 months depending upon the variety and the stage of fruit maturity. Early varieties including Gravensteins can be stored up to 3 months, mid-season varieties such as McIntosh up to 4 months and late-season varieties up to 6 months. An old refrigerator can be utilized for cold storage.

DISEASES: Apple scab is the major disease that concerns the average home gardener. Spores of this fungus are released during prolonged periods of wet weather from May to August. Infections produce dark green to black spotted areas on the leaves and fruit about 15 days after the wet period. Severe infections of the foliage can result in leaf drop, poor tree growth, and poor blossoming the following spring. These black circular spots on the fruit can crack and deform the fruit depending upon what stage of fruit development when the infection takes place.

Canker is caused by fungal diseases that attack the bark of fruit trees. There are a number of cankers that attack fruit trees but the two most common cankers in the Atlantic Region are European and Anthracnose. The spread of these diseases can often be associated with winter (low temperature) injury. If left untreated, these diseases can result in limb loss, reduced fruit production and eventual death of the tree. The spread of canker can be kept in check by sanitation practices. Small limbs with canker can be removed during dormant pruning. The prunings should be removed from the area and burned. Cankers on the trunk or large limbs should be removed by cutting out the infected bark. All of the obviously infected bark must be removed plus an additional one centimeter of apparently healthy bark on the sides and two centimeters on the top and bottom of the canker. The exposed area should be coated with a wound dressing.

INSECTS: Apple trees are host to a number of insects that can damage the foliage, fruit and wood. The damage may only be minor; it can be such that it makes the apple unsuitable for consumption or may even threaten the life of the tree. The type and population of an insect alone should be the terminating factor with regards to its control.

Winter moth and green fruitworm - Several species of caterpillars will feed on apple leaves and fruit in the early part of the year. The leaf damage is not usually serious but under certain circumstances caterpillar feeding can defoliate a tree. When a caterpillar feeds on a young fruit, a depressed, russeted area is left on the mature fruit. The damaged fruit is edible.

Tent caterpillars - These insects can be numerous in some years and scarce in others. Hatching of the eggs occurs in May as the leaves are first opening. Tent caterpillars can be controlled while massed on the branches or while in the nest. Crushing by hand can be an adequate method and insecticide may be unnecessary. Spot treatments can be effective if insecticides are used.

Codling moth - The larvae of the moth attack apples during the month of July. The caterpillar makes an obvious hole in the skin of the apple and usually tunnels towards the core. Droppings of the caterpillar are often pushed out of the tunnel onto the surface of the apple and they are helpful in identifying codling moth damage. The traditional "wormy apple" is caused by the codling moth larva.

Apple maggot - The adult apple maggot is a two-winged fly with a distinctive branched pattern on the wings. The larvae are true maggots which burrow through the flesh of the apple and cause brown tracks. Fruit damage by the apple maggot usually drops to the ground prematurely. The removal of native hawthorne trees and the immediate destruction of drop apples will reduce

the apple maggot population. On a few trees, it may be possible to obtain adequate control of adult flies by using maggot traps (yellow sticky traps or red plastic balls coated with a sticky material). Maggot traps will need to be in place from July 15 to early September.

Mites - Mites are tiny arthropods that can barely be seen without magnification. Some species feed on the sap of the leaves which causes the leaves to become brittle and bronzed. Mites are not usually a serious problem for the home gardener but excessive use of broad spectrum insecticides can cause problems.

Aphids - Green apple and rosy apple are the two main aphids found on apple trees. Damage is caused by the sucking of sap from the leaves and fruit. The feeding damage is characterized by rolled or twisted leaves. In the case of rosy apple aphids, the fruit can be dwarfed and deformed. Ants are often a good sign of aphids feeding as the ants feed on the sap extruded by the aphids.

WILDLIFE: The feeding of mammals on the bark, shoots and fruit buds of apple trees can stunt tree growth and kill the tree. Severity of feeding damage depends on location of the trees and local wildlife populations.

Deer: Deer will browse the terminal growth on young fruit trees which weakens the trees. Repeated browsing will stunt tree growth and possibly kill the tree. Winter browsing of fruit buds will reduce crop load. Fencing the tree in, particularly using an electrical fence will provide the best deterrent to deer browsing. If fencing is not practical the hanging of a bar of soap in a young tree is the second best option for deer control.

Mice and voles: These rodents will feed on the bark of trees and roots during the winter months when food is scarce. Feeding damage is more prevalent in years of prolonged heavy snow cover. Mowing around and under fruit trees will reduce the habitat for rodents and the placement of a mouse guard on the trunk of the tree will help reduce rodent damage.

SAFE USE OF PESTICIDES: Always handle pesticides with care.

1. Before using any pesticide, read the label carefully. Take note of precautions to be followed when using a specific product.

2. Avoid spilling pesticides on yourself or in the immediate area where you are working. If this should happen, wash yourself immediately with plenty of water to remove all traces of the pesticide in your eyes, nose or mouth.

3. Do not smoke or eat while you are applying a pesticide. Wait until you have washed.

4. When applying a pesticide, do not permit material to blow back on you, others or pets.

Consult the following spray schedule as to the time of insect and disease problems.

HOME GARDEN SPRAY SCHEDULE FOR APPLES

Stage of Development	Disease or Insects	Remarks
Silver Tip (late April - early May)	Red mite eggs	Dormant oil spray should provide good red mite control. Thorough coverage of the wood is required.
Green Tip (when green tips appear on buds)	Apple scab	After green tissue appears, the foliage of non disease resistant varieties should be sprayed before the first rainy period.
Pre-Pink (when flower buds are exposed)	Apple scab Tent caterpillar	Spot sprays may be adequate.
Pink (just before blossoms open)	Apple scab Winter moth Green fruit worm	The foliage must be thoroughly sprayed
Calyx (when petals have fallen)	Apple scab Rosy apple aphid	
First Cover (June 20-25)	Apple scab	
Second Cover (July 1-5)	Apple scab Codling moth	
Third Cover (July 13-15)	Apple scab Codling moth Apple maggot	
Fourth Cover (July 25-27)	Apple scab Apple maggot	
Fifth Cover (Aug. 4-6)	Apple maggot	

Consult your local Garden Centre or Department of Agriculture for suitable pest control products to control problems.

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